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Multi-Threaded Routing Toolkit (MRT) Routing Information Export Format  
with BGP Additional Path Extensions

Abstract

This document extends the Multi-threaded Routing Toolkit (MRT) export format for Border Gateway Protocol (BGP) routing information by supporting the advertisement of multiple paths in BGP extensions.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 7841.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at <http://www.rfc-editor.org/info/rfc8050>.

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## 1. Introduction

The MRT record format [RFC6396] was developed to provide researchers and engineers a means to encapsulate, export, and archive routing protocol transactions and RIB snapshots.

The Advertisement of Multiple Paths in BGP [RFC7911] defines a BGP extension to allow the advertisement of multiple paths for the same address prefix without the new paths implicitly replacing any previous ones.

This document contains an optional extension to the MRT format [RFC6396] and introduces additional definitions of MRT subtype fields to permit representation of multiple path advertisements [RFC7911].

## 2. Rationale

MRT parsers are usually stateless. In order to parse BGP messages that contain data structures that depend on the capabilities negotiated during the BGP session setup, the MRT subtypes are utilized. The Advertisement of Multiple Paths [RFC7911] extension for BGP alters the encoding of the BGP Network Layer Reachability Information (NLRI) format for withdraws and announcements. Therefore, new BGP4MP/BGP4MP\_ET subtypes as defined in [RFC6396] are required to signal to an MRT parser how to parse the NLRI.

In Section 4.3 of the MRT specification [RFC6396], RIB subtypes are specified. Prefix length and prefix fields are encoded in the same manner as the BGP NLRI encoding. In order to support Path Identifier information as defined in [RFC7911], new subtypes need to be added.

The following two sections define the required subtypes.

### 3. MRT Subtypes for Types BGP4MP/BGP4MP\_ET

This document defines the following new subtypes:

- o BGP4MP\_MESSAGE\_ADDPATH
- o BGP4MP\_MESSAGE\_AS4\_ADDPATH
- o BGP4MP\_MESSAGE\_LOCAL\_ADDPATH
- o BGP4MP\_MESSAGE\_AS4\_LOCAL\_ADDPATH

The fields of these message types are identical to the equivalent non-additional-path versions specified in Section 4.4 of [RFC6396]. These enhancements continue to encapsulate the entire BGP message in the BGP message field.

### 4. MRT Subtypes for Type TABLE\_DUMP\_V2

This document defines the following new subtypes:

- o RIB\_IPV4\_UNICAST\_ADDPATH
- o RIB\_IPV4\_MULTICAST\_ADDPATH
- o RIB\_IPV6\_UNICAST\_ADDPATH
- o RIB\_IPV6\_MULTICAST\_ADDPATH
- o RIB\_GENERIC\_ADDPATH

The fields of these message types are identical to the equivalent non-additional-path versions specified in Section 4.3 of [RFC6396]. However, for the case of the 4 AFI/SAFI-specific RIB subtypes, the existing RIB Entries field is redefined as detailed in the sections below.

4.1. AFI/SAFI-Specific RIB Subtypes

In order to preserve the record compaction achieved by using the most common subtypes and allow multiple RIB Entries to be stored in a single TABLE\_DUMP\_V2 record, the existing RIB Entries field is redefined for use within the new AFI/SAFI-specific RIB subtypes defined by this document as follows:

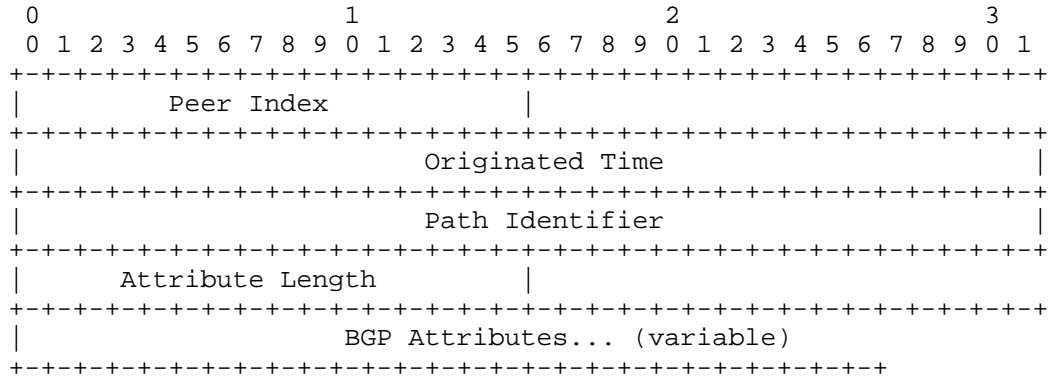


Figure 1: RIB Entries for AFI/SAFI-Specific RIB Subtypes with Support for Additional Paths

This adds a field to the RIB Entries record to store the Path Identifier when used with the RIB\_IPV4\_UNICAST\_ADDPATH, RIB\_IPV4\_MULTICAST\_ADDPATH, RIB\_IPV6\_UNICAST\_ADDPATH, and RIB\_IPV6\_MULTICAST\_ADDPATH subtypes.

4.2. RIB\_GENERIC\_ADDPATH Subtype

The fields of this subtype are identical to the equivalent non-additional-path versions specified in Section 4.3.3 of [RFC6396]. These fields continue to encapsulate the raw and additional-path-enabled AFI/SAFI/NLRI in the record, and the raw attributes in the RIB Entries.

For clarity, the RIB Entries in this subtype are not redefined.

## 5. IANA Considerations

IANA has assigned the subtype codes defined below in the "Multi-threaded Routing Toolkit (MRT)" registry  
<<https://www.iana.org/assignments/mrt>>.

### 5.1. BGP4MP/BGP4MP\_ET Subtype Codes

The following have been registered in the "BGP4MP Subtype Codes" and "BGP4MP\_ET Subtype Codes" registries:

- 8 BGP4MP\_MESSAGE\_ADDPATH (RFC 8050)
- 9 BGP4MP\_MESSAGE\_AS4\_ADDPATH (RFC 8050)
- 10 BGP4MP\_MESSAGE\_LOCAL\_ADDPATH (RFC 8050)
- 11 BGP4MP\_MESSAGE\_AS4\_LOCAL\_ADDPATH (RFC 8050)

### 5.2. TABLE\_DUMP\_V2 Subtype Codes

The following have been registered in the "TABLE\_DUMP\_V2 Subtype Codes" registry:

- 8 RIB\_IPV4\_UNICAST\_ADDPATH (RFC 8050)
- 9 RIB\_IPV4\_MULTICAST\_ADDPATH (RFC 8050)
- 10 RIB\_IPV6\_UNICAST\_ADDPATH (RFC 8050)
- 11 RIB\_IPV6\_MULTICAST\_ADDPATH (RFC 8050)
- 12 RIB\_GENERIC\_ADDPATH (RFC 8050)

## 6. Security Considerations

It is not believed that this document adds any additional security considerations. However, the security considerations of [RFC6396] are equally applicable to this document, because this document permits the export of more detailed routing data.

An organization that uses the MRT format to store their BGP routing information should be aware that supporting these extensions permits more detailed network path information to be stored and should consider the implications of this within their environment.

An organization that peers with public BGP collectors and enables the capability for additional paths on a peering session should be aware that it is exporting not only its best paths, but potentially other paths within its networks. The BGP peer should consider any and all implications of exposing this additional data.

## 7. Normative References

- [RFC6396] Blunk, L., Karir, M., and C. Labovitz, "Multi-Threaded Routing Toolkit (MRT) Routing Information Export Format", RFC 6396, DOI 10.17487/RFC6396, October 2011, <<http://www.rfc-editor.org/info/rfc6396>>.
- [RFC7911] Walton, D., Retana, A., Chen, E., and J. Scudder, "Advertisement of Multiple Paths in BGP", RFC 7911, DOI 10.17487/RFC7911, July 2016, <<http://www.rfc-editor.org/info/rfc7911>>.

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